DOCUMENT RESUME

ED 250 468 CE 039 897

AUTHOR Wells, Keith; And Others
TITLE Agricultural Occupations. A Competency Based Articulated Curriculum.
INSTITUTION Indian Hills Community Coll., Ottumwa, Iowa.
SPONS AGENCY Iowa State Dept. of Public Instruction, Des Moines.
PUB DATE 82
NOTE 115p.; For related documents, see CE 039 894-899. Developed in cooperation with Merged Area XV High Schools.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Agricultural Education; Agricultural Engineering; Agricultural Machinery; Agricultural Occupations; *Articulation (Education); College School Cooperation; Competence; *Competency Based Education; *Course Content; Curriculum Development; Curriculum Guides; Educational Mobility; Educational Planning; Educational Policy; Institutional Cooperation; Job Analysis; *Job Skills; Occupational Information; Program Content; Secondary Education; Student Evaluation; Task Analysis; Transfer Policy; Two Year Colleges; Vocational Education

ABSTRACT

This document is a competency-based curriculum guide designed to promote articulation in agricultural education programs between and among secondary and postsecondary institutions in the Indian Hills Community College and Merged Area XV high schools in Iowa. The guide is organized in nine sections. The first six sections provide background information about the articulation project, the audiences served and competencies developed, testing procedures, and provisions for transfer of credits. Section VII, which makes up the greater part of the document, details the competencies in 12 areas needed by entry-level farm workers and the enabling tasks needed to become proficient in the competencies. Each competency consists of three parts that, when used in combination, provide a detailed outline of major tasks that a student must accomplish to reach one or more previously stated student outcomes. The three parts are the task that the student must accomplish, the conditions under which the student must demonstrate the skills, and standards of acceptable performance. The final two sections of the guide are a list of job titles available in the local area keyed to relevant competencies and a glossary of terms used in agricultural education. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IA821310/

ED250468

Indian Hills Community College
in cooperation with
Merged Area XV High Schools
presents

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
J. Aitken
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

A COMPETENCY BASED ARTICULATED CURRICULUM FOR

AGRICULTURAL OCCUPATIONS

A pilot project undertaken in cooperation with The Iowa State Department of Public Instruction

CE039897

TABLE OF CONTENTS

I. Statement of Authorship 1

II. Introduction 3

III. Acknowledgements 5

IV. Project Policy Statement 7
Definition of Articulation 8
Audiences Served 8
Competencies Developed. 8

V. Testing Procedures 9

VI. Transfer of Credit 11

VII. Competencies 15

A. A.C. Electricity. 1-2 18
B. Animal Nutrition 1-7 20
C. Basic Soils and Fertility . . . 1-5 27
D. Electric Arc Welding 1-4 32
E. Farm Gas Welding 1-3 37
F. Farm Carpentry 1-2 40
G. Farm D. C. Electricity. 1-22 43
H. Farm Records 1-6 65
I. Feeds and Feeding 1-7 72
J. Feeds and Managing Feeder Calves 1-5 79
K. Marketing Beef Cattle 1-5 84
L. Small Gas Engines 1-2 89

VIII. Job Opportunities 93

Farm A.C. Electricity and Animal Nutrition 95
Basic Soils & Fertility 96
Electric Arc Welding and Gas Welders 97
Farm Carpentry and D. C. Electricity 98
Basic Farm Records 99
Feeds and Feeding & Feeding and Managing Feeder Calves 100
Marketing Beef Cattle and Small Gasoline Engines 101

IX. Glossary 102

I. STATEMENT OF AUTHORSHIP

AGRICULTURE

The Director of this project is indebted to the following persons for their exemplary contributions to this publication. Compilation of this model reflects individual faculty preferences. Attempts to reproduce the effort with different faculty will likely produce variances in style.

AUTHORS

Keith Wells
Fairfield Community School Dist.
East Broadway
Fairfield, Iowa 52556
1-515-472-3347

Scott Moxom
Blakesburg Community School
Box 98
Blakesburg, Iowa 52536
1-515-938-2203

Garland Ashbacher
Washington Hall
Kirkwood Community College
Box 2068
Cedar Rapids, Iowa 52338
1-319-398-5568

Everett Pilkington
Indian Hills Community College
Ottumwa Industrial Airport
Ottumwa, Iowa 52501
1-515=683-1557

PROJECT COORDINATOR

Tom Williamson
Articulation Project Coordinator
Indian Hills Community College
Grandview and Elm
Ottumwa, Iowa 52501
1-515-683-5125

II. INTRODUCTION

INTRODUCTION

Indian Hills Community College, the twenty-six Local Education Agencies of Merged Area XV, Southern Prairie Area Education Agency XV (AEA), and the Iowa State Department of Public Instruction share a common commitment to offer current vocational opportunities to Iowans. This commitment has been demonstrated by undertaking a competency based Vocational Articulation project. In an effort to improve opportunities for students of secondary and post-secondary programs in Merged Area XV, those institutions mentioned above endeavored to create a solution to curricular problems such as redundancy, and gaps in subjects, occurring between secondary and post-secondary institutions. On October 21, 1981, an effort toward modifying existing curriculum was initiated by the Iowa Department of Public Instruction, Indian Hills Community College, Southern Prairie Area Education Agency XV, and all local Education Agencies in Merged Area XV. Persons instrumental in conceiving the project include: Jim Athen, Director of Career Education and Dr. Howard Hammond, Director of Teacher Certificatior, State Department of Public Instruction; Dr. John Van Ast, Associate Professor of Higher Education, Iowa State University; Ed Kuntz, Principal of Ottumwa High School; and Dr. Stephen M. Poort, Dean of Instruction, Indian Hills Community College.

III. ACKNOWLEDGEMENTS

ACKNOWLEDGEMENTS

I am especially indebted to the members of the task force who provided sound counsel and strong support throughout the duration of this 24 month project. Task force members serving on behalf local secondary schools were: Dave Hotchkiss, Drafting (Ottumwa); Carol Gullion, Secretarial (Ottumwa); Ron Langgin, Electronics (Ottumwa); Keith Wells, Agriculture (Fairfield); Scott Maxom, Agriculture (Blakesburg); Harley Hecker, Welding (Ottumwa); and Carl Lawrence, Machine Shop (Ottumwa). Serving as task force members on behalf Indian Hills Community College were: Carl Moore, Drafting; Linda Poli and Connie Schmitz, Secretarial; Jerry Harshman, Electronics; Charles Rosenbalm and Dave McQuoid, Welding; and Everett Pilkington, Agriculture. Garland Ashbacher, Kirkwood Community College, served in support of the Agriculture model.

A special word of appreciation is due the following persons for their assistance in shaping the final form of this project. They are: Ed Kuntz, Principal and Ed Meyer, Vocational Director, Ottumwa High School; Don Smith, Consultant, State Department of Public Instruction; Ray Wingate, Educational Services Director, (AEA); Chuck Lawson, Vocational Director, Indian Hills; Bob Allison, Business Technologies Chairperson, Indian Hills; Betty Guest, Project Secretary; and Lew Debo and Shannon Vesely, Editors. Recognition should also be given the selected private sector persons who helped on two occasions to reaffirm those competencies developed by task force members for each of the six vocational curriculum models.

It was our purpose to put forth a road map on the articulation process that could be emulated by interested educators elsewhere in Iowa. The effort described in this model is one of the six end products of the total articulation process. Should the reader desire a copy of the final report he/she should contact Jim Athen, Director of Career Education, State Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.

Stephen M. Poort, Ed.D.
Project Director

Thomas Williamson, M.A.
Project Coordinator

IV.

PROJECT POLICY STATEMENT
DEFINITION OF ARTICULATION
AUDIENCES SERVED
COMPETENCIES DEVELOPED

PROJECT POLICY STATEMENT

DEFINITION OF ARTICULATION

Articulation, as defined in this project, is the sequential development of occupational competencies in a non-repetitive fashion building from simple to more complex competencies.

This project provides an articulated system for coordinating the preparation of students to enter the world of work. It is intended to: (a) assure the quality of training at various levels; (b) eliminate repetition and learning gaps as students move from one level of mastery to the next; (c) provide uniform methods of measuring acquired skills of students in various competencies; (d) record those measurements for the benefit of students, prospective employers, and educators who would improve quality of curriculum; (e) encourage employers to match personnel qualifications to specific job requirements; and (f) enable beginning students to understand what they are expected to learn.

AUDIENCES SERVED

Project materials are designed for use by any or all of the following educationally-related groups: students, teachers, administrators, counselors, private sector representatives, and college registrars. Applications vary in accordance with user needs; however, specific suggestions on recommended usage can be found in the body of the final report.

COMPETENCIES DEVELOPED

Competencies have been developed for each of the six vocational programs and articulated from the secondary to the post-secondary level. A separate listing of those competencies can be found in the body of each of the models.

V. TESTING PROCEDURES

TESTING PROCEDURES

The following represents those testing procedures in place as of June 30, 1984.*

	Test on Secondary Level	Test on Post-Secondary Level	Competency Record Maintained
AGRICULTURAL OCCUPATIONS	X		X
BUSINESS OCCUPATIONS	OPTIONAL	X	X
DRAFTING		X	X
ELECTRONIC TECHNOLOGY		X	X
MACHINE TRADES		X	X
WELDING OCCUPATIONS		X	X

For answers to more specific questions regarding testing competency based articulated curriculum, participants are encouraged to contact any of the task force representatives identified on the authors' page of this model.

*Additional information such as individual course listings can be provided by contacting any of the authors of this curriculum model as well as the college registrar.

VI. TRANSFER OF CREDIT

TRANSFER OF AGRICULTURE CURRICULUM

SECONDARY

COMPETENCIES	SEMESTER CREDITS	CATALOG NO.	COURSE
J.1 through J.5	2	None	Vocational Agriculture I
K.1 athrough K.5	2	None	Vocational Agriculture II
I.1 through I.7	2	None	Vocational Agriculture III

TRANSFER OF AGRICULTURE CURRICULUM

SECONDARY

COMPETENCIES	SEMESTER CREDITS*	CATALOG NO.	COURSE
A.1, A.2	½ credit per semester	None	Vo-Ag III A.C. Electricity
D.1, D.2, D.3, D.4	½ credit per semester	None	Vo-Ag IV Arc Welding
F.1, F.2	½ credit per semester	None	Vo-Ag I Carpentry
E.1, E.2, E.3	½ credit per semester	None	Vo-Ag IV Gas Welding
L.1, L.2	½ credit per semester	None	Gas Engines

* The reader should keep in mind that secondary and post-secondary semester credits may be assigned using different methods.

POST-SECONDARY TRANSFER OF AGRICULTURE CURRICULUM

COMPETENCIES		SEMESTER CREDITS	KIRKWOOD CATALOG NO.	COURSE
A.C. Electricity D.C. Electricity	A.1, A.2 G.1 through G.22	1	CS060U	Rural Electricity
Animal Nutrition	B.1 through B.7	2	AG150U	Livestock Nutrition
Feeds and Feeding	I.1 through I.7			
Basic Soils & Fertility	C.1 through C.5	2	AG298U	Basic Soils
Electric Arc Welding Gas Welding	D.1, D.2, D.3, D.4 E.1, E.2, E.3	2	MM011U	Rural Metals and Welding
Small Gasoline Engines	L.1, L.2	3	MH013U	Engines I

These credits are assigned at Kirkwood Community College. It would strictly depend on the contract agreement signed with the high schools and agreement by a particular department head to determine whether the above credits would transfer or not. Therefore, the above is ONLY a SUGGESTED arrangement.

VII. COMPETENCIES

COMPETENCIES

Each competency consists of three parts that, when used in combination, provide a detailed outline of a major task that a student must accomplish to reach one or more previously-stated student outcomes. Competencies are described as follows:

a. Task - what the student must accomplish to demonstrate ability to perform the job outlined.

b. Conditions - A description of the circumstances under which the student demonstrates the skill. Usually included are:

   1. time allowance;
   2. tolerances allowed;
   3. references utilized;
   4. specific materials and tools needed;
   5. work location (if other than school site);
   6. and, other limitations unique to the task.

c. Standards of Acceptable Performance - Criteria described that constitute acceptable performance.

   These criteria must:

   1. be compatible with the task and condition;
   2. evaluate all components of the conditions;
   3. include the percentage of responses that must be correct if the competency is primarily cognitive;
   4. and, specify the standard of the criteria.

Competencies needed for initial employment are represented in this model. They are neither designated nor described by grade level. A student may complete all competencies available at a school subject to learning capability and time limitations. Competencies listed in this model do not attempt to represent all those taught at any participating secondary or post-secondary school.

A C ELECTRICITY

COMPETENCY NO. 1

TASK:

Explain how electricity works and how to fuse circuits.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet on farm electricity, and an instructor-led discussion, the student will pass a written test with a minimum score of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Explain how electricity flows through wires.
2. Explain how a light works and motor turns by electricity.
3. Explain how a fuse works and its purpose.
4. Calculate size of fuse for different circuits and loads.

A C ELECTRICITY

COMPETENCY NO. 2

TASK:

Make sketches for wiring circuits.

CONDITIONS AND LIMITATIONS:

Given a text book or pamphlet on electricity and an instructor-led discussion, the student will draw the blueprint for installing the wiring for a small farm building.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Make drawing for a fuse box and entrance.
2. Draw wiring for all circuits in a farm building.
3. Determine load and service entrance size.
4. Give specifications for wire size.
5. Draw in switch, outlets, lights and other load connections.
6. Plan project for efficiency and safety.

SUGGESTIONS ON ELECTRICITY MATERIALS

1. Shopwork on the Farm - Jones
2. Electric Repair and Service - Manly
3. National Electrical Code -NFPA
4. Electrical Textbook for Farming - SDREC
5. Practical Wiring - Sears

ANIMAL NUTRITION

COMPETENCY NO. 1

TASK:

Demonstrate understanding of the influence of environment on nutritional requirements.

CONDITIONS AND LIMITATIONS:

Be able to identify necessary nutritional requirements based on the animal's environment and designated use of the animal, given text, instructor-led discussions and observation of animals in an array of environmental settings.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Recognize the value of nutritional requirements influenced by environment.

ANIMAL NUTRITION

COMPETENCY NO. 2

TASK:

Identify the importance of a balanced ration.

CONDITIONS AND LIMITATIONS:

Given a textbook on animal nutrition, the student will pass a written test with a minimum grade of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Recognize differences between crude and digestible protein.
2. Describe the relationship of roughage-concentrate ratio to feed efficiency.
3. Identify the advantage of using high moisture grain.
4. List the nutritional requirements of livestock.

ANIMAL NUTRITION

COMPETENCY NO. 3

TASK:

Describe the effects of feed preparation on performance of livestock.

CONDITIONS AND LIMITATIONS:

Given a school farm or availability of a farm or farms in the district, a textbook on animal nutrition, and an instructor-led class discussion, the student will complete the criteria to standards acceptable to the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List common problems in livestock performance that can be traced to improper feed preparation.
2. List the use of necessary nutrients.
3. Explain the value of proper feed storage.
4. Describe common feed additives and their value.

ANIMAL NUTRITION

COMPETENCY NO. 4

TASK:

Recognize the causes of variation in the nutritive value and palatability of feed.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlets on animal nutrition, various samples of feed and instructor-led class discussion, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List the causes of variation in the nutritive value of feed.
2. List the causes of variation in the palatability of feed.
3. Describe preventative measures to protect the nutritive value of feed.
4. Describe preventative measures to protect the palatability of feed.

ANIMAL NUTRITION

COMPETENCY NO. 5

TASK:

Identify the anatomy of the ruminent system.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussion, the student will become familiar with the anatomy of the ruminent system.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Correctly label a diagram of the ruminent digestive system.

ANIMAL NUTRITION

COMPETENCY NO. 6

TASK:

Understand the physiology of the ruminant digestive system.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussions, the student will become familiar with the physiology of the ruminent digestive system.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Match the anatomical parts of the ruminant digestive system with their functions.

ANIMAL NUTRITION

COMPETENCY NO. 7

TASK:

Relate the ruminant digestive system functions to the digestion of a bovine ration.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussions, the student will become aware of the relationship of the function of the ruminent digestive system to bovine rations.

CRITERIA OF ACCEPTABLE PERFORMANCE:

L. Understand breakdown of feedstuff and track each element through the entire digestive process.

BASIC SOILS AND FERTILITY

COMPETENCY NO. 1

TASK:

Relate the history and factors involved in soil development

CONDITIONS AND LIMITATIONS:

Given any one of a large number of textbooks on basic soils, textbook study questions, or workbook or study questions prepared by instructor, and a written test, the student will correctly complete a minimum of 80% of the written work. The student will participate in 100% of the activities.

CRITERIA FOR ACCEPTABLE PERFORMANCE:

1. Describe soil and terms associated with soil.
2. Explain the five major factors responsible for soil formation.
3. Distinguish between chemical and physical weathering.
4. Differentiate between the various transported soils: glacial, loessial, colluvial and alluvial.
5. Recognize the difference between igneous, metamorphic, and sedimentary rock formations.
6. Compare the effect of prairie and forest vegetation on soil formation.

   The student will take a written test prepared by the instructor on the above six areas. This will be completed after reading, completing worksheets, and participating in class discussion. In addition, the student will participate in Activity 7, and either 8, 9 or 10.
7. Take class field trips to road cuts, gravel pits, strip mines, construction sites, or other such areas to observe soil formation characteristics.
8. Collect samples of igneous, metamorphic, and sedimentary rocks and discuss the types of soils that are formed from them.
9. Take soil probes in forest, prairie, and transitional soils.
10. Visit a stream to observe soil translocation and sedimentation.

BASIC SOILS AND FERTILITY

COMPETENCY NO. 2

TASK:

Determine the physical properties of soils.

CONDITIONS AND LIMITATIONS:

Given a basic soils and soil fertility textbook and an instructor-led class discussion, the student will obtain a minimum passing grade of 80% on a written comprehensive test over Criteria 1 through 7. Given soil profiles in a tray or color slides or pictures; slides on soil color, soil survey map of at least one county in the school district; tape measure, texture triangle, clay, sand, silt, and loan soil samples, 4 fruit jars, an outdoor soil profile, and a hand level with an eye sight, the student will perform to the instructor's satisfaction Criteria 9 through 11.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Label and explain a drawing showing the different layers of a soil profile.
2. Draw a circle graph showing the composition of average soil.
3. Distinguish between soil structure and texture.
4. Match soil colors with identifying characteristics.
5. Explain water movement and retention in soil.
6. Identify five kinds of soil structure.
7. Determine the factors causing the color formation in different colored top soils and subsoils.
8. Determine the soil texture name using both the texture triangle and the mudball-ribbon methods
9. Determine percent of slope, degree of erosion, soil depth, and permeability
10. Explain a minimum of five different soil profiles
11. Collect samples of soils that have different levels of organic matter, and place the samples in jars of water and shake. Allow to settle overnight, and then observe organic natter content and soil particle size

BASIC SOILS AND FERTILITY

COMPETENCY NO. 3

TASK:

Assess the chemical properties of soil.

CONDITIONS AND LIMITATIONS:

Given a textbook on basic soils and/or soil pamphlets, and an instructor-led class discussion, and a written test, the student will correctly complete a minimum of 80% of the questions correctly on the written test.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify the 16 essential elements for plant growth.
2. Classify essential soil elements as either major nutrients, secondary nutrients, or micro-nutrients.
3. Explain the cation exchange theory.
4. Determine and explain pH levels of soil.
5. Explain the relationship of liming and soil nutrient release and uptake.
6. Identify cations and anions and discuss their interactions in the soil
7. Explain the relationship of moisture in the soil and chemical release of nutrients.
8. Interpret ammonification, nitrification, and denitrification reactions.
9. Interpret the content of the Iowa Soil Conservancy Law.

BASIC SOILS AND FERTILITY

COMPETENCY NO. 4

Task:

Test soil for proper nutrient content.

CONDITIONS AND LIMITATIONS:

Given a soil probe or auger, shovel, two 5-gallon pails, soil sample bags, soil sample information forms, a completed soil test report, field or areas to take soil samples, soil survey map, pamphlet on soil testing, universal soil loss equation, 4 flags on wire stakes, land measuring wheel, and portable soil test kit, the student will perform the following criteria to the instructor's satisfaction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Take a representative soil sample.
2. Identify soil areas to avoid or sample separately.
3. Properly fill out a soil sample information sheet.
4. Measure and mark one acre of land.
5. Interpret soil test reports.
6. Determine if a soil sample is acid, neutral, or alkaline, using pH scale.
7. Detect soil nutrient deficiencies with a portable test kit.
8. Calculate the amount of lime required to convert soil pH.
9. Describe the calcium carbonate equivalent of various liming materials.
10. Interpret soil survey formation and determine crop suitability ratings.
11. Compute soil loss using the universal soil loss equation.

BASIC SOILS AND FERTILITY

COMPETENCY NO. 5

Task:

Selection of fertilizers.

CONDITIONS AND LIMITATIONS:

Given fertilizer instructional materials and a field trip to a fertilizer plant, the student will pass a written test over the listed criteria. A minimum passing grade is 80%. Fertilizer instructional materials could include Agronomy Handbook for High School Students prepared by Iowa State University, current soils or crop production textbook, fertilizer pamphlets from colleges and industry, current fertilizer price lists, samples of currently used fertilizer materials, soil test results, and worksheets.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Define fertilizer ratios and determine what is in a bag of fertilizer.
2. Identify the nutrients commonly deficient in soil.
3. Compare gas, liquid, and solid forms of fertilizer.
4. Identify the equipment needed to handle various forms of fertilizer.
5. Describe the relative advantages of common nutrient sources.
6. Match fertilizer analysis data with readily available fertilizer materials.
7. Explain the chemical and physical reactions of fertilizer in the soil.
8. Compute fertilizer cost per pound of nutrient from different available sources.
9. Determine best fertilizer source based on time and method of application.
10. Determine fertilizer requirements based on soil text recommendations.
11. Substitute one grade analysis of fertilizer for another grade analysis to get the desired nutrients required.

ELECTRIC ARC WELDING

COMPETENCY NO. 1

TASK:

Explain how a welder works and how to make a strong weld in all positions and with different metals.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet, and instruction including demonstrations and practice, the student will pass a written test with a minimum grade of 80% or more.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Describe types of welders and how they operate.
2. Explain the different welding positions.
3. Describe the different types of welds.
4. Identify the different electrodes and their purpose.

ELECTRIC ARC WELDING

COMPETENCY NO. 2

TASK:

Demonstrate welding in the different positions.

CONDITIONS AND LIMITATIONS:

Given the welding material and after instruction with practice, the student will make a strong flat weld, vertical weld, and a horizontal weld.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Make a complete strong flat weld ¼" metal and upward movement.
2. Make a complete strong vertical weld on sheetmetal and downward travel.
3. Make a complete strong vertical weld, ¼" metal and upward movement.
4. Make a strong horizontal weld.
5. Make a strong and complete overhead weld.

ELECTRIC ARC WELDING

COMPETENCY NO. 3

TASK:

Demonstrate the different welds.

CONDITIONS AND LIMITATIONS:

Given welding material and after instruction and practice, the student will make the different types of welds.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Make a 6" butt weld.
2. Make a 6" edge weld.
3. Make a 6" fillet weld.
4. Make a 6" lap weld.
5. Make a 6" corner weld.

ELECTRIC ARC WELDING

COMPETENCY NO. 4

TASK:

Demonstrate welding different kinds of metal.

CONDITIONS AND LIMITAIONS:

Given the different kinds of metal and electrodes, after instruction and practice, the student will weld cast iron, high carbon steel, aluminum, do hard facing and cutting.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Make a cast iron weld with the correct electrode.
2. Make a spring steel weld with the correct electrode.
3. Weld aluminum with the correct electrode.
4. Hardface a link of tractor chain with the correct electrode.
5. Cut a piece of ½" thick metal with the correct electrode.

SUGGESTIONS ON A C WELDING INSTRUCTIONAL MATERIAL

1. Pamphlet prepared by Lincoln Electric Company

2. New Lessons in Arc Welding - Lincoln Electric Company

3. Farm Arc Welding - Lincoln Electric Company

4. Shopwork on the Farm - Jones

FARM GAS WELDING

COMPETENCY NO. 1

TASK:

Explain how gas welding works and the different kinds of gas welding.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet on gas welding, and with instruction and practice, the student will pass a written test with a minimum grade of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Explain how gas and oxygen mix in a flame for heating.
2. Describe how to adjust the flame for heating and cutting.
3. List the kinds of gas and their characteristics.

FARM GAS WELDING

COMPETENCY NO. 2

TASK:

Select the correct torch tip and correct rods for a welding job.

CONDITIONS AND LIMITATIONS:

Given different welding torches, tips and rods, the student will select the correct tip and rod for the job.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Select tips for heavy welding.
2. Select tips for light welding.
3. Clean a tip correctly.
4. Select a rod for welding mild steel.
5. Select a rod for welding cast iron.
6. Attach a cutting torch and adjust flame.

FARM GAS WELDING

COMPETENCY NO. 3

TASK:

Use gas welding equipment for flat, vertical and horizontal welding and for cutting.

CONDITIONS AND LIMITATIONS:

Provided with a gas welder, rods and material, the student will make the common types of welds, using different welding positions, and will demonstrate cutting with the torch.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Weld two pieces of 1/8" metal flat with brazing rod.
2. Weld two pieces of ¼" metal flat with brazing rod.
3. Make a vertical weld.
4. Make a horizontal weld.
5. Cut ¼" metal for a distance of 6 inches.

FARM CARPENTRY

COMPETENCY NO. 1

TASK:

Make sketches and drawings for a farm building and read blueprints made by others.

CONDITIONS AND LIMITATIONS:

Given material for making a blueprint and after instruction, the student will make a readable blueprint of a small farm building.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Make a sketch and the blueprints for a small hog house with all specifications.

2. Build a small hog house by following a blueprint.

FARM CARPENTRY

COMPETENCY NO. 2

TASK:

Identify lumber, metal, fasteners, paint, etc. and explain their use on farm buildings.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet on carpentry and instruction, the student will pass a written test with a minimum grade of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Compare efficiency costs between wood and metal for farm buildings.
2. Lay out and cut common rafters.
3. Select and use carpenter tools and equipment.
4. Identify and explain painting problems.

SUGGESTIONS ON FARM CARPENTRY INSTRUCTION MATERIALS

1. Shop Work on the Farm - Jones

2. Farm Mechanics Projects - Phipps

3. Farm Carpentry - Siegle

FARM D. C. ELECTRICITY

COMPETENCY NO. 1

TASK:

Measure resistance with an ohmmeter.

CONDITIONS AND LIMITATIONS:

Given a textbook and/or a shop manual, a work sheet, an ohmmeter and a safe non-conductive work area, the student will perform to standards accepted by the instructor and industry.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Define color code and polarity of test leads.
2. Adjust meter hand to zero on infinite end of scale.
3. Connect test leads and adjust hand to zero on face.
4. Perform measurement in ohms.
5. Explain accuracy of meter movement.
6. Define battery polarity of ohmmeter.
7. Describe circuit of ohmmeter.
8. Explain ranges on ohmmeter ability.
9. Recommend plan of action.
10. Observe safety standards.

FARM D. C. ELECTRICITY

COMPETENCY NO. 2

TASK:

Measure direct current voltage with voltmeter.

CONDITIONS AND LIMITATIONS:

Given a schematic, a voltmeter, a voltage source and a safe test area, the student will demonstrate to a standard that meets or exceeds industry requirements.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Recognize voltage pressure to be measured.
2. Calculate what range to operate meter in.
3. Demonstrate adjustment possibilities on zeroing meter.
4. Describe test leads color code and/or polarity.
5. Demonstrate a parallel voltage hookup.
6. Give examples of using voltmeter testing in a series.
7. List safety rules governing use of voltmeter.
8. Recommend plan of action.
9. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 3

TASK:

Perform resistor test.

CONDITIONS AND LIMITATIONS:

Given a resistor, ohmmeter and nonconductable work area, the student will apply color code and measurement resistance in ohms. Student will proceed in normal sequence and comply to safety standards. He/she will perform to industry standard and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify resistor.
2. Correlate color coding.
3. Record code into numbers.
4. Apply numbers into ohms resistance.
5. Set-up ohmmeter to proper scale.
6. Review specifications sheet.
7. Recommend plan of action.
8. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 4

TASK:

Perform armature test.

CONDITIONS AND LIMITATIONS:

Given an armature, a handout pamphlet, an accepted standard tester/ growler, the student will demonstrate with proficiency to instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Analyze armature for: opens - broken wire/loose solder joints
   ground - revolve armature at one complete turn (using metal strip) in growler and identify any buzzing condition
   shorts - using test prods and meter, identify any bar that does not come with standards
2. Describe verbally standards that have been achieved.
3. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 5

TASK:

Perform alternator rotor test.

CONDITIONS AND LIMITATIONS:

Given a rotor, ohmmeter and specification sheet, student will perform test for open, short, and ground, performing to satisfaction of instructor and industry standards.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify pole shoes.
2. Distinguish slip-rings and wire connections.
3. Relate number of pole-pairs.
4. Test roter for; 1) open, 2) short, 3) ground.
5. Interpret outcome.
6. Recommend plan of action.
7. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 6

TASK:

Perform generator fields test.

CONDITIONS AND LIMITATIONS:

Given an ohmmeter or saturation leakage tester, student will complete tests according to manufacturer's specification and to satisfaction of instructor. Safety rules will be observed and a safe work area will be provided.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify field assembly.
2. Calculate 6, 12, or 24 volts.
3. Test for open, short, and ground.
4. Record ohm reading and compare to specification.
5. Recommend plan of action.
6. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 7

TASK:

Perform stator windings test.

CONDITIONS AND LIMITATIONS:

Given a stator and ohmmeter, student will complete test to satisfaction of instructor and meet standards. Student will relate test connections and describe stator wiring schematic.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify stator type.
2. Give examples of the various type hookups with ohmmeter.
3. Take ampere draw reading (referral of handout) 3 legs.
4. Explain and detail visial inspection of windings.
5. Identify failure possibilities - open, short, ground.
6. Identify ampere size.
7. Recommend plan of action.
8. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 8

TASK:

Perform solenoid voltage test.

CONDITIONS AND LIMITATIONS:

Given a solenoid, a source battery and a battery load tester, student will demonstrate closing voltage to engage solenoid. Student will explain electrical hookups and practice safety rules. Test will conform to standards and instructor acceptance. Sequence in testing will be adhered to.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify solenoid.
2. Relate system voltage.
3. Demonstrate test machine hookups.
4. Identify relay "closing voltage" (specification sheet).
5. Record voltage required to close relay.
6. Compare to manufacturer specifications.
7. Identify winding being pressured (pull-in/hold-in) (classroom).
8. Recommend plan of action.
9. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 9

TASK:

Perform starter solenoid test.

CONDITIONS AND LIMITATIONS:

Given a solenoid with "S" and "R" poles, student will perform necessary voltage checks for closure and failure possibilities. Student will be given voltmeter and carbon-pile plus ohmmeter. A correct voltage battery and jumper cables will be supplied. Student will perform tests to satisfy industry standards and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify solenoid.
2. Relate system voltage.
3. Demonstrate test machine "hookups."
4. Identify relay "closing voltage" (specification sheet).
5. Record voltage required to close relay.
6. Compare to manufacturer specifications.
7. Identify winding being pressured (pull-in/hold-in) (classroom).
8. Recommend plan of action.
9. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 10

TASK:

Perform condenser test.

CONDITIONS AND LIMITATIONS:

Given a condenser and tester, the student will comply to rules of safety and industry standards. Student will perform to satisfaction of instructor and perform in a suitable behavioral manner.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify condenser.
2. Chart microfarads written on condenser.
3. Demonstrate tester and hookup.
4. Test for open and short.
5. Record microfarad capacity (test machine).
6. Recommend plan of action.
7. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 11

TASK:

Perform diode test.

CONDITIONS AND LIMITATIONS:

Given a diode and tester, student will test according to instructor acceptance and industry standard. Compliance to all safety standards will be demonstrated.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify diode.
2. Specify positive or negative.
3. Demonstrate tester set-up.
4. Demonstrate forward bias.
5. Demonstrate reverse bias.
6. Demonstrate open circuit.
7. Relate testing failure possibilities.
8. Demonstrate soldering/heat sink (if applicable).
9. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 12

TASK:

Perform transistor test.

CONDITIONS AND LIMITATIONS:

Given a transistor, proper tester and non-conducting work area, the student will test transistor in compliance to industry standards. Student will perform in accordance with direction of instructor and will satisfy demands inherent to solid-state devices.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify transistor.
2. Relate type - NPN or PNP.
3. Select proper tester and polarity hookups.
4. Demonstrate base to emitter hookup and record (forward and reverse bias).
5. Demonstrate base to collector hookup and record (forward and reverse bias).
6. Demonstrate solder technique and heat sink.
7. Elaborate on failure possibilities.
8. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 13

TASK:

Perform battery specific gravity test.

CONDITIONS AND LIMITATIONS:

Given a wet cell battery and hydrometer, student will analyze float reading and demonstrate measuring technique identifying charge level, freeze level and correct reading to compensate for temperature of acid. Strict safety precautions will be demonstrated and maintained throughout demonstration. Student will perform to satisfy industry and instructor standards.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify battery.
2. Relate voltage.
3. Select tester with thermometer.
4. Demonstrate gravity "float" line in bulb.
5. Record specific gravity of individual cells.
6. Compare point spread (if any).
7. Comment when point spread is at maximum (best cell to worst).
8. Recommend plan of action.
9. Observe all safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 14

TASK:

Perform hydrometer-battery test (temperature corrected).

CONDITIONS AND LIMITATIONS:

Given a hydrometer and temperature gauge, the student will specific gravity test battery acid and record readings. Safety goggles will be worn during entire test section. Student will compare and record test and compare to handout. Student will be judged or accuracy. safety routine and verbal feedback. Rubber gloves are optional. Student will perform to meet pre-set standards and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Review acid temperature and correct point differential.
2. Demonstrate use of specific gravity tester
3. Record specific gravity of individual cells and compare to specification sheet.
4. Relate battery condition in respect to "fully charged".
5. Visually inspect for acid leakage.
6. Chart "highest cell reading" vs. "lowest cell reading".
7. Compare to standards in handout.
8. Recommend plan of action.
9. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 15

TASK:

Perform maximum load battery test.

CONDITIONS AND LIMITATIONS:

Given a wet cell battery, a safe work area and reputable tester, the student will demonstrate maximum load testing and apply ampere hour ratings. Strict safety precautions will be demonstrated and maintained. Student will perform in accordance to battery manufacturer specifications, test machine application book, classroom handouts and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE.

1. Identify battery.
2. Compute total battery voltage.
3. Apply load test machine.
4. Observe and comply to acid temperature maximum (classroom).
5. Relate amp. hour rating and battery voltage.
6. Record voltage of all cells under ampere load.
7. Compare cell voltage to specifications sheet.
8. Recommend plan of action.
9. Observe all safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 16

TASK:

Perform coil test.

CONDITIONS AND LIMITATIONS:

Given a tester, coil and safe test area, the student will compare ohms to provided specification sheet and will also use scope coil test section. Student will test to industry standards and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify coil and voltage requirement.
2. Coil/tester or ohmmeter test for open, short, or grounds.
3. Prepare scope coil test and compare to text wiring schematic.
4. Analyze output tower for carbon cracks.
5. Compare scope pattern to handout (primary oscillation after fields collapse).
6. Apply machine for maximum secondary voltage.
7. Compare outcome to specification sheet.
8. Observe safety precautions (classroom instruction).

FARM D. C. ELECTRICITY

COMPETENCY NO. 17

TASK:

Perform coil scope test.

CONDITIONS AND LIMITATIONS:

Given a coil and reputable diagnostic tester, student will analyze coil for maximum output voltage and number of oscillations on scope screen. Student will demonstrate hook-up ability and interpretation on scan screen. Student will communicate to instructor what he comprehends on screen. Demonstration will be performed in accordance to test analyzer recommendations and judged to manufacturer specifications. Student will demonstrate in a safe and proper manner, complying to industry standards and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify coil.
2. Identify proper test machine.
3. Relate proper wiring hookup.
4. Apply machine for maximum attainable voltage.
5. Record maximum voltage.
6. Review collapse oscillations (stretching pattern).
7. Record number of oscillations.
8. Compare diagnosis to manufacturer's specification.
9. Recommend plan of action.
10. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 18

TASK:

Perform mechanical current-voltage regulator adjustment.

CONDITIONS AND LIMITATIONS:

Given a workable generator, a current-voltage regulator and reputable test machine, student will measure and test components of regulator. Student will demonstrate to recommended standard and practice safety guidelines, proceeding in sequence to comply with instructor satisfaction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify regulator.
2. Relate ground identity (if applicable).
3. Review schematic.
4. Identify system "A" or "B".
5. Perform air gap adjustment.
6. Acquire proper testing tools.
7. Adjust cutout voltage closing relay spring tension.
8. Adjust voltage sensing spring tension.
9. Adjust current sensing spring tension.
10. Compare to time value and temperature compensation chart.
11. Apply temperature correction.
12. Compare outcomes to manufacture recommendation.
13. Recommend plan of action.
14. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 19

TASK:

Perform test of alternator with mechanical regulator.

CONDITIONS AND LIMITATIONS:

Given an alternator with mechanical adjustable regulator, student will demonstrate with reputable test machine 1) field closing relay, 2) normal range voltage sensing, and 3) maximum attainable amps. Student will identify circuitry, wiring schematics, alternator type "A" or "B", manufacturer and model number, identify alternator amp, rating stamped on case (some alternators), test for reverse flow "dormant alternator," and maintain safety guidelines and perform in a sequential manner, meeting industry standards and instructor acceptance.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify alternator.
2. Relate circuit type (A or B).
3. Communicate "how it works" - alternator and regulator.
4. Review schematics -- detail circuit hookup.
5. Demonstrate voltage closing relay.
6. Demonstrate adjusting voltage sensing to specifications.
7. Demonstrate maximum attainable amps.
8. Demonstrate reverse amp. flow (dormant alternator).
9. Demonstrate field current draw in amps.
10. Define ¼ ohm resistance method.
11. Chart
12. Compare test chart to manufacturer specifications.
13. Recommend plan of action.
14. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 20

TASK:

Perform test of alternator with integrated circuitry.

CONDITIONS AND LIMITATIONS:

Given an alternator with solid state internal/external regulator, student will perform tests showing rotor speed, rotor amps, maximum output amps. and voltage limit sensing. Student will demonstrate proper test methods using carbon pile, ¼-ohm resistance simulating fully charged battery and use of voltmeter and ammeter. He/she will relate wiring color code on tester in respect to vehicle ground. Student will also demonstrate method of testing for amp. draw in dormant alternator. He/she will maintain safety standards. Student will perform in logical sequence, demonstrating to meet industry standard and instructor acceptance. Due to ICC circuitry, student will demonstrate precisely in accordance to forward bias and voltage polarity.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Recognize alternator.
2. Identify manufacturer.
3. Apply vendor schematics (from classroom).
4. Relate verbally "how it functions."
5. Identify battery polarity relative to system.
6. Apply test machine for maximum amps.
7. Record maximum attainable amps.
8. Apply test machine for sensing shut down level (using resistance method).
9. Record voltage.
10. Measure ampere draw of rotor.
11. Compare records to manufacturer's specification.
12. Recommend plan of action.
13. Observe all safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 21

TASK:

Perform ampere - draw test for starter.

CONDITIONS AND LIMITATIONS:

Given a starter and tester, student will demonstrate ampere draw in a bench test application. A fully charged battery and non-flamable area will be furnished for test. Student will demonstrate normal room temperature draw (bench test) and compare to specification sheet. Safety rules will be observed. Student will perform in a sequential manner in accordance to classroom instruction and industry standards.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify starter.
2. Relate voltage required.
3. Test starter and record voltage.
4. Hook up tester to battery and carbon pile voltage down (classroom).
5. Record amps.
6. Compare amps. to specification sheet.
7. Recommend plan of action.
8. Observe safety precautions.

FARM D. C. ELECTRICITY

COMPETENCY NO. 22

TASK:

Troubleshooting,

CONDITIONS AND LIMITATIONS:

Given a problem to solve, student will demonstrate abilities of judgment, recall and practical assessment. Sequency and safety precautions will be practiced as well as cleanliness. Student will perform in professional methods matching industry standards and instructor/customer satisfaction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Know system.
2. Ask operator (if available).
3. Inspect system.
4. Operate machine and/or system (if possible).
5. List possible causes.
6. Reach conclusion.
7. Test conclusion.
8. Apply common sense.
9. Recommend plan of action.
10. Observe safety precautions.

FARM RECORDS

COMPETENCY NO. 1

TASK:

Identify and compare record systems, methods, and value of keeping them.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet on farm records, record samples, worksheets, and instructor-led class discussion, the student will pass a written test with a minimum grade of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Recognize the value, functions, services provided, cost, records, and business analysis of various record keeping systems available to farmers

2. Describe the values and uses of complete and accurate farm business and personal records

3. List weaknesses commonly found in farm records

4. Relate the differences, advantages, and disadvantages of accrual and cash systems

FARM RECORDS

COMPETENCY NO. 2

TASK:

Recognize farm record system terminology.

CONDITIONS AND LIMITATIONS:

Given a textbook or pamphlet on farm records, record samples, worksheets, and instructor-led class discussion, the student will pass a written test with a minimum grade of 80%. The student will also be given figures and situation of a farm business and complete income and expense records on this farm business to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Interpret and compute net worth.
2. Interpret and compute net income.
3. Explain the difference between farm and non-farm accounts.
4. Distinguish the difference between and give examples of asset and liability accounts: external and holding.
5. Define and give examples of receipt and expense accounts (operating or service accounts) and earnings or productive enterprise accounts.
6. Complete and interpret crop and livestock production efficiency records.
7. Explain and work an example of owner's equity.
8. Define and give examples of assets; current, working, and fixed.
9. Distinguish and give examples of categories of liabilities (short, imtermediate, and long-term).
10. Recognize and give examples of casualty losses.

FARM RECORDS

COMPETENCY NO. 3

TASK:

Calculation and control of farm inventory.

CONDITIONS AND LIMITATIONS:

Given a farm records textbook, pamphlet on inventory valuation, farm record samples, current farm prices, and inventory problems, the student will complete the criteria to standards acceptable by the instructor. A school farm or other farm or farms in the district is also needed.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Define inventory and record keeping process used to get it.

2. Describe inventory evaluation guidelines.

3. Interpret the common methods used in evaluating inventory which are: market cost value, net market price, farm production costs, cost minus depreciation, and replacement cost, and under what situations they are used.

4. Inventory the livestock, or feed, or equipment and machinery, or supplies and buildings used in a farm business.

FARM RECORDS

COMPETENCY NO. 4

TASK:

Apply depreciation schedules and methods.

CONDITIONS AND LIMITATIONS:

Given subject matter materials on depreciation, instructor-led class discussion, and instructor demonstrations of working depreciation problems with different depreciation methods, the student will pass a written test on depreciation with a minimum score of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify the three major purposes of depreciating an asset.
2. Give examples of the three major courses associated with depreciation: wear and tear, absolescence, and deterioration.
3. Prepare a depreciation schedule for any two of the following: equipment, machinery, buildings, and breeding livestock. Use straight-line and declining balance methods for both depreciation schedules.

FARM RECORDS

COMPETENCY NO. 5

TASK:

Preparing farm enterprise budgets.

CONDITIONS AND LIMITATIONS:

Given a pamphlet (or other source at the instructor's discretion), necessary figures on cost and scope, and budget forms, the student will complete the criteria to minimum standards or better as determined by the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Describe the advantages of a complete and comprehensive budget.

2. Identify common problems in establishing a budget and adhering to it.

3. Prepare a minimum of two livestock and two crop budgets. Use the following enterprises: beef, dairy, horses, sheep, swine, corn, soybeans, oats and hay.

FARM RECORDS

COMPETENCY NO.6

TASK:

Analysis of farm records.

CONDITIONS AND LIMITATIONS:

Given all materials from othr tasks on farm records and instructor-led class discussion, the student will pass a written test with a minimum grade of 80%.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Analyze and identify strengths and areas of weakness in a net worth statement.

2. Compute the following efficiency factors for given farm enterprises: productior per animal, gross income, total expenses, net returns, total feed cost, return per $100 of feed fed, feed cost per pound of production, return per $100 invested, yield per acre, dollar return per acre, total expense per acre, and return per unit (bushel, pound or ton).

SUGGESTIONS ON FARM RECORDS INSTRUCTIONAL MATERIALS:

1. Pamphlet prepared by Agriculture Education Department at Iowa State University.

2. Variety of pamphlets prepared by Cooperative Extension Service at Iowa State University.

3. Ohio State University materials such as "Ohio Farm Management Handbook" and "Farm Business Planning and Analysis Program and Teaching Units".

4. Wide variety of record materials from Illinois Vo-Ag Service, Mumford, Ill.

FEEDS AND FEEDING

COMPETENCY NO. 1

TASK:

List the function, deficiency symptoms, amounts found in Iowa farm grown grains, and amounts found in commercial feed for each of the six classes of nutrients.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussion, student will be able to identify the six classes of nutrients and the function, deficiency symptoms, and amounts found in Iowa farm grown grains, and amounts found in commercial feeds for each.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Chart the six classes of nutrients.
2. List the functions for each class of nutrient.
3. List the deficiency symptoms for each class of nutrient.

FEEDS AND FEEDING

COMPETENCY NO. 2

TASK:

Show understanding of biological processes associated with digestion.

CONDITIONS AND LIMITATIONS:

Given a text and instructor-led discussions, student will be able to list and describe the process of digestion.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List organs of digestion in the order in which food enters them.
2. Describe the process involved in that organ.

FEEDS AND FEEDING

COMPETENCY NO. 3

TASK:

Define terms commonly used in the feed industry.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussions, student will become familiar with the different antibiotics and recognize the need for withdrawal of livestock drugs.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify different antibiotics according to livestock needs.

2. Recognize the importance of and need for withdrawal of livestock drugs.

FEEDS AND FEEDING

COMPETENCY NO. 4

TASK:

Identify growth and feed efficiency patterns of differing species and ages within species.

CONDITIONS AND LIMITATIONS:

Given text and instructor-led discussion, student will understand the growth and feed efficiency patters of differing species.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Graph the growth patterns of differing species.

2. Graph the feed efficiency patterns of differing species.

FEEDS AND FEEDING

COMPETENCY NO. 5

TASK:

Differentiate feedstuff ingredients and the purposes for using each.

CONDITIONS AND LIMITATIONS:

Given text and teacher-led discussion, each student will become familiar with feed ingredients and their purposes.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List foodstuff ingredients.
2. List purposes for using each ingredient.

FEEDS AND FEEDING

COMPETENCY NO. 6

TASK:

Formulate basic rations using "square methods".

CONDITIONS AND LIMITATIONS:

Given a text and instructor-led discussions, the student will become competent in using the "square method".

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Define "square method".

2. Formulate a ration with this method.

FEEDS AND FEEDING

COMPETENCY NO. 7

TASK:

Analyze a feed tag and tell how this information is of value to a livestock producer.

CONDITIONS AND LIMITATIONS:

Given text and various feed tags, the student will be able to read and understand the value of the information on feed tags.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Explain the importance to livestock producers of information on feed tags.

2. Analyze a sample feed tag, listing pertinent information and its use.

FEEDING AND MANAGING FEEDER CALVES

COMPETENCY NO. 1

TASK:

Determine how to successfully move calves from pasture to full feed.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets and/or articles on feeder calves, the student will complete the criteria to the instructor's satisfaction.

CRITERIA FOR ACCEPTABLE PERFORMANCE:

1. List the steps one must complete to move calves from pasture to full feed.
2. Note the amount of time for each step.
3. Explain the purpose and value of each step.

FEEDING AND MANAGING FEEDER CALVES

COMPETENCY NO. 2

TASK:

Estimate the time, cost and amount of feed required to feed a 500 pound animal to 1,000 pounds.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets, and/or articles on feeder calves and current prices for various feeds, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Compare the prices and nutritive values of grains and grain substitues.
2. Compare the prices and nutritive values of protein and protein substitutes.
3. Compare the various feeding methods.
4. Choose a ration and feeding method.
5. Estimate the weight gain per pound of ration.

FEEDING AND MANAGING FEEDER CALVES

COMPETENCY NO. 3

TASK:

Explain the proper care of new feeder cattle during the first four days.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets, and/or articles on feeder cattle, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List the common problems of new feeder calves.
2. Describe the ration for new feeder calves for the first four days.
3. Explain the preventative measures to be taken in light of the problems of new feeder calves.

FEEDING AND MANAGING FEEDER CALVES

COMPETENCY NO. 4

TASK:

Formulate a balanced ration for cattle on full feed.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets, and/or articles on feeder cattle, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Analyze the nutritive value of silage.
2. Compare the advantages and disadvantages of home ration mixing and a commercial ration mix.
3. List the nutrients and their amounts necessary for a balanced ration.
4. Find grains, silage and/or suppiements to meet the nutritive requirements of cattle.

FEEDING AND MANAGING FEEDER CALVES

COMPETENCY NO. 5

TASK:

Appreciate the place of additives and pre-mixes in cattle feeding.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets, and/or articles on feeder cattle, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEFTABLE PERFORMANCE:

1. Describe the importance of salt in the development of feeder cattle.
2. Describe the importance of minerals other than salt in the development of feed cattle.
3. Define the value of urea in cattle feeding.
4. List the benefits of antibotics in cattle feeding.

MARKETING BEEF CATTLE

COMPETENCY NO. 1

TASK:

List and compare the various methods of marketing livestock.

CONDITIONS AND LIMITATIONS:

Given a textbook, pamphlets and/or articles on marketing, and instructor-led class discussion, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List the various methods of marketing.
2. List the advantages for each of these methods.
3. List the disadvantages for each of these methods.

MARKETING BEEF CATTLE

COMPETENCY NO. 2

TASK:

Study the fluctuation in market cattle.

CONDITIONS AND LIMITATIONS:

Given market records for the past five years, textbook and/or pamphlets on marketing, the student will complete the criteria to the instructor's satisfaction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List market fluctuations in the past 5 years.
2. Plot market fluctuations of the past 5 years on a graph.
3. Note seasonal trends in the market.
4. Explain the common causes of market fluctuations.

MARKETING BEEF CATTLE

COMPETENCY NO. 3

TASK:

Understand the processes in getting beef from market to consumers.

CONDITIONS AND LIMITATIONS:

Given a textbook and/or pamphlets on marketing and instructor-led class discussion, the student will complete the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List the processes in getting beef from market to consumers.
2. Numerate these processes in chronological order.
3. Note cost/price increases during these processes.

MARKETING BEEF CATTLE

COMPETENCY NO. 4

TASK:

Each student will grade carcasses.

CONDITIONS AND LIMITATIONS:

Given carcasses of slaughtered cattle, textbook, pamphlets, and/or articles on beef marketing and instructor-led class discussions, the student will complete the criteria to the instructor's satisfaction.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Inspect the carcasses.
2. Note leanness, marbling.
3. Give the appropriate grade to each carcass.
4. Justify the grading on the basis of notes taken during inspection.

MARKETING BEEF CATTLE

COMPETENCY NO. 5

TASK:

Describe the proper care in handling cattle for market from the home farm.

CONDITIONS AND LIMITATIONS:

Given textbook, pamphlets and/or articles on beef marketing, a school farm or availability of farm(s) in the district and instructor-led class discussion, the student will meet the criteria to the satisfaction of the instructor.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. List observations of various types of livestock handling equipment.
2. List advantages and disadvantages of each.
3. List common problems and/or injuries that can be traced to improper equipment.

SMALL GASOLINE ENGINES

COMPETENCY NO. 1

TASK:

Dissassemble and assemble a small gasoline engine.

CONDITIONS AND LIMITATIONS:

Given a manual on small engines and after instructor guidance, the student will disassemble a live engine and assemble it back to running order.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Explain the function of the engine parts.
2. Identify all engine parts.
3. Read specification charts and diagrams.

SMALL GASOLINE ENGINES

COMPETENCY NO. 2

TASK:

Make repairs and adjustments to a small gasoline engine.

CONDITIONS AND LIMITATIONS:

Given a manual, parts and tools, and after instructor guidance, the student will repair and adjust a small engine to good working condition.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Install and adjust ignition points and condensor.
2. Check coil and adjust air gap.
3. Grind valves and adjust.
4. Install rings and check gap.
5. Torque connecting rod bolts and head bolts.

SUGGESTIONS ON SMALL ENGINE INSTRUCTION MATERIALS

1. 4-H booklet - Iowa State University

2. Tractor and Small Engine Maintenance - Brown

3. Small Engine Service Manual - Technical Publications

4. Small Engine Repair - Briggs and Stratton

SUGGESTED INSTRUCTIONAL MATERIALS

SMALL GASOLINE ENGINES

4-H booklet from Iowa State University

Tractor and Small Engine Maintenance - Brown

Small Engine Service Manual - Technical Publications

Small Engine Repair - Briggs and Stratton

FARM CARPENTRY

Shop Work on the Farm - Jones

Farm Mechanics Projects - Phipps

Farm Carpentry - Siegle

ALTERNATING CURRENT ELECTRICITY

Shop Work on the Farm - Jones

Electric Repair and Service - Manly

National Electrical Code - NFPA

Electrical Textbook for Farming - SDREC

Practical Wiring - Sears

ELECTRIC ARC WELDING

Pamphlet prepared by Lincoln Electric Company

New Lessons in Arc Welding - Lincoln Electric Company

Farm Arc Welding - Lincoln Electric Company

Shop Work on the Farm - Jones

GAS WELDING

Shop Work on the Farm - Jones

Booklets offered by gas welding companies

VIII. JOB OPPORTUNITIES

JOB OPPORTUNITIES

Many of the competencies listed in this booklet lead to jobs that are available in the 10 counties served by the 26 Local Education Agencies and Indian Hills Community College in Southeastern Iowa. Students, teachers, and counselors may use the following information in designing course emphases for more effective instruction and counseling.

OCCUPATIONS

FARM A.C. ELECTRICITY

OCCUPATION	D.O.T. NUMBER
Electrical Helper	821.667-010
Electrician Apprentice	824.261-014

ANIMAL NUTRITION

Farm Worker, Livestock	410.664-010
Animal Caretaker	410.674-010
Farmworker, Dairy	410.684-010
Livestock Yard Attendant	410.674-018
Farmer, General	421.161-010
Farmworker, General	421.683-010
Farmworker, General II	421.687-010

OCCUPATIONS

BASIC SOILS & FERTILITY

Occupation	D.O.T. Number
Farm Worker - Diversified Crops	407.663-010
Farm Worker - Field Crops	404.663-010
Farm Worker - General	421.663-010
Farm Worker - Grain	401.663-010
Soil Test Lab Employee	029.261-010
Truck Driver - Grain and Supplies	402.161-010
Soil Conservation Aide	040.061-054
Grain and Feed Mill Operator	520.685-098
Farm Worker - Machine Operator	409.686-010

OCCUPATIONS

ELECTRIC ARC WELDING

OCCUPATION	D.O.T. NUMBER
Farmer, General	401.101-010
Farmworker, General	421.683-010
Welder, Productive Line	819.684-010
Welder, Combination	819.384-010

GAS WELDERS

Farmer	421.161-010
Farmworker, General	421.683-010
Welder, Production Line	819.684-010
Welder, Combination	819.384-010

OCCUPATIONS

FARM CARPENTRY

OCCUPATION	D.O.T. NUMBER
Farmworker, General	421.683-010
Farmworker, General II	421.687-010
Carpenter	860.381-022
Carpenter Apprentice	860.381-026

D.C. ELECTRICITY

Farm Mechanics and Repairers	624
Supervisor, Farm Equipment Maintenance	624.131-010
Farm Equipment Mechanic (agriculture equipment)	624.281-010
Farm Equipment Mechanic - apprentice	624.281-014
Assembly repairer	624.381-010
Farm Equipment Mechanic	624.381-014
Farm Machinery Set-up	624.381-018

OCCUPATIONS

BASIC FARM RECORDS

OCCUPATION	D.O.T. NUMBER
Farm Worker - Animal	410.674-010
Farm Worker - Field Crop	404.663-010
Farm Worker - General	421.683-010
Farm Worker - Grain	401.683-010

OCCUPATIONS

FEEDS AND FEEDING

Occupation	D.O.T. Number
Farmworker, Livestock	410.664-010
Animal Caretaker	410.674-010
Farmworker, Dairy	410.684-010
Livestock Yard Attendant	410.674-018
Farmer, General	410.161-010
Farmworker, General	421.683-010
Farmworker, General II	421.687-010
Sales Rep., Livestock	260.251-010
Sales Rep., Animal Feed Products	272.357-010

FEEDING AND MANAGING FEEDER CALVES

	410.664-010
Animal Caretaker	410.674-010
Farmworker, Dairy	410.684-010
Livestock Yard Attendant	410.674-018
Farmer, General	410.161-010
Farmworker, General	421.683-010
Farmworker, General II	421.687-010
Sales Rep., Livestock	260.251-010
Sales Rep., Animal Feed Products	272.357-010

OCCUPATIONS

MARKETING BEEF CATTLE

OCCUPATION	D.O.T. NUMBER
Farmworker, Livestock	410.664-010
Animal Caretaker	410.674-010
Farmworker, Dairy	410.684-010
Livestock Yard Attendant	410.674-018
Farmworker, General	410.161-010
Farmworker, General II	421.687-010
Sales Rep., Livestock	260.251-010
Sales Rep., Animal Feed Products	272.357-010

SMALL GASOLINE ENGINES

Sales Rep., Farm & Garden Equipment and Supplies	272.357-014
Farm Equipment Mechanic Apprentice	624.281-014
Farm Equipment Mechanic	624.281-010
Assembly Repairer	624.381-010
Small Engine Mechanic	625.281-034

IX. GLOSSARY

GLOSSARY

Definitions included in this glossary are for use in the articulated curriculum model. Applications of those terms outside this model may require a slightly different interpretation.

GLOSSARY

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

ALTERNATOR...A device which converts mechanical energy into electrical energy.

ALTERNATING CURRENT (A.C.)..A flow of electrons which reverses its direction of flow at regular intervals in a conductor.

AMMETER...An instrument for measuring the flow of electrical current in amperes.

AMPERE...The quantity of electrons passing a given point in one second.

AMPERE-HOUR...A unit of measure for battery capacity.

ARMATURE...The movable part of a generator or motor. It is made up of conductors which rotate through a magnetic field to provide voltage or force by electromagnetic induction.

ARTIFICIAL MAGNETS...A magnet which has been magnetized by artificial means.

ATOM...A particle which is the smallest unit of a chemical element. It is made up mainly of electrons (minus charges) in orbit around protons (positive charges).

BENDIX DRIVE...One type flywheel engaging device for a starting motor. It is said to be mechanical because it engages by inertia.

BREAK...See "Open"

BRUSH...A device which rubs against a rotating slip ring or commutator to provide a passage for electric current to a stationary conductor.

CAPACITOR...A device which stores an electrical charge. Commonly used for storing a-c voltage spikes.

CHARGE...To restore the active materials in a battery by the passage of direct current through it.

CIRCUIT...A continuous, unbroken path along a conductor through which electrical current can flow from a source, through various units, and back to the source.

CIRCUIT BREAKER...A device to protect an electrical circuit from overloads. The breaker acts as a switch and opens when the current passing through the circuit exceeds the rated level.

COIL (IGNITION)...A transformer which steps up voltage to produce ignition sparks.

COLD RATING...The cranking load capacity of a battery at low temperature.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

COMMUTATOR...A device for reversing the direction of current flowing through the conductors of the rotating armature in a motor or for assuring a one-direction (d.c.) flow of current from a generator.

CONDENSER...An automotive term which describes a capacitor.

CONDUCTOR...A substance or body through which an electrical current can be transmitted.

CONVENTIONAL THEORY...The theory which states that the direction of current flow is from positive to negative in a circuit.

CURRENT...Movement of electricity along a conductor. Current is measured in amperes.

CURRENT FLOW...The flow or movement of electrons from atom to atom in a conductor.

CYCLING...The process by which a battery is discharged and recharged.

DIODE...An electrical device that will allow current to pass through itself in one direction only.

DIRECT CURRENT (D.C.)...A steady flow of electrons moving steadily and continually in the same direction along a conductor from a point of high potential to one of lower potential. It is produced by a battery, generator, or rectifier.

DISCHARGE...To remove electrical energy from a charged body such as a capacitor or battery.

DISTRIBUTOR (IGNITION)...A device which directs the ignition of an engine.

DYER DRIVE...One type of flywheel engaging mechanism in a starting motor.

ELECTRICAL FIELD...The region around a charged body in which the charge has an effect.

ELECTRICITY...The flow of electrons from atom to atom in a conductor.

ELECTROCHEMICAL...The relationship of electricity to chemical changes and with the conversions of chemical and electrical energy. A battery is an electrochemical device.

ELECTROLYTE...Any substance which, in solution, is dissociated into ions and is thus made capable of conducting an electrical current. The sulfuric acid-water solution in a storage battery is an electrolyte.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

ELECTROMAGNETIC CLUTCH...An electromagnetic device which stops the operation of one part of a machine while other parts of the unit keep on operating.

ELEMENT...(1) Any substance that normally cannot be separated into different substances. (2) The completed assembly of a battery consisting of negative plates, positive plates, and separators mounted in a cell compartment.

ELECTROMAGNET...A core of magnetic material, generally soft iron, surrounded by a coil of wire through which electrical current is passed to magnetize the core.

ELECTROMAGNETIC FIELD...The magnetic field about a conductor created by the flow of electrical current through it.

ELECTROMAGNETIC INDUCTION...The process by which voltage is produced in a conductor by varying the magnetic field so that lines of force cut across the conductor.

ELECTROMOTIVE FORCE...The force which tends to cause a flow of electricity. It may be compared to the pressure which causes water to flow through a pipe. Electromotive force is measured in volts.

ELECTRON...A tiny particle which rotates around the nucleus of an atom. It has a negative charge of electricity.

ELECTRON THEORY...The theory which explains the nature of electricity and the exchange of "free" electrons between atoms of a conductor. It is also used as one theory to explain direction of current flow in a circuit.

FUNDAMENTAL LAW OF MAGNETISM...The fundamental law of magnetism is that unlike poles attract each other, and like poles repel each other.

FUSE...A replaceable safety device for an electrical circuit. A fuse consists of a fine wire or a thin metal strip encased in glass or some fire resistant material. When an overload occurs in the circuit, the wire or metal strip melts, breaking the circuit.

GENERATOR...A device which converts mechanical energy to electrical energy.

GRID...A wire mesh to which the active materials of a storage battery are attached.

GROUND...A ground occurs when any part of a wiring circuit unintentionally touches a metallic part of the machine frame.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

GROUNDED CIRCUIT...A connection of any electrical unit to the frame, engine, or any part of the tractor or machine, completing the electrical circuit to its source.

GROWLER...A device for testing the armature of a generator or motor.

HYDROMETER...An instrument for measuring specific gravity. A hydrometer is used to test the specific gravity of the electrolyte in a battery.

INDUCTANCE...The property of an electric circuit by which an electromotive force (voltage) is induced in it by a variation of current either in the circuit itself or in a neighboring circuit.

INDUCTOR...A coil of wire wrapped around an iron core.

INSULATOR...A substance or body that resists the flow of electrical current through it.

ION...An atom having either a shortage or excess of electrons.

ISOLATION DIODE...A diode placed between the battery and the alternator. It blocks any current flow from the battery back through the alternator regulator when the alternator is not operating.

LINE OF FORCE...Invisible lines which conveniently illustrate the characteristics of a magnetic field and magnetic flux about a magnet.

MAGNET...A body which has the property of attracting iron or other magnets. Its molecules are aligned.

MAGNETIC FIELD...That area near a magnet in which its property of magnetism can be detected. It is shown by magnetic lines of force.

MAGNETIC FLUX...The flow of magnetism about a magnet exhibited by magnetic lines of force in a magnetic field.

MAGNETIC INDUCTION...The process of introducing magnetism into a bar of iron or other magnetic material.

MAGNETIC LINES OF FORCE...Invisible lines which conveniently illustrate the characteristics of a magnetic field and magnetic flux about a magnet.

MAGNETIC MATERIAL...Any material to whose molecules the property of magnetism can be imparted.

MAGNETIC NORTH...The direction sought by the north pole end of a magnet, such as a magnetic needle, in a horizontal position. It is near the geographic north pole of the Earth.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

MAGNETIC SOUTH...The opposite direction from magnetic north towards which the south pole end of a magnet, such a magnetic needle, is attracted when in a horizontal position. It is near the geographic south pole of the Earth.

MAGNETIC SWITCH...A solenoid which performs a simple function, such as closing or opening switch contacts.

MAGNETISM...The property inherent in the molecules of certain substances, such as iron, to become magnetized, thus making the substance into a magnet.

MOLECULE...A unit of matter which is the smallest portion of an element or compound that retains chemical identity with the substance in mass. It is made up of one or more atoms.

MOTOR...A device which converts electric energy into mechanical energy.

MUTUAL INDUCTION...Occurs when changing current in one coil induces voltage in a second coil.

NATURAL MAGNET...A magnet which occurs in nature, such as a lodestone. Its property of magnetism has been imparted by the magnetic effects of the earth.

NEGATIVE...Designating or pertaining to a kind of electricity. Specifically, an atom that gains negative electrons is negatively charged.

NEUTRON...An uncharged elementary practicle. Present in all atomic nuclei except the hydrogen nucleus.

NON-MAGNETIC MATERIAL...A material whose molecules cannot be magnetized.

OHM...The standard unit for measuring resistance to flow of an electrical current.

OHMMETER...An instrument for measuring the resistance in ohms of an electrical circuit.

OHM'S LAW...Ohm's Law states that when an electric current is flowing through a conductor, such as a wire, the intensity of the current (in amperes) equals the electromotive force (volts) driving it, divided by the resistance of the conductor. The flow is in proportion to the electromotive force, or voltage, as long as the resistance remains the same.

OPEN OR OPEN CIRCUIT...An open or open circuit occurs when a circuit is broken, such as by a broken wire or open switch, interrupting the flow of current through the circuit.

GLOSSARY OF TERMS

OVERRUNNING CLUTCH...One type of the flywheel engaging portion of a starting motor.

PARALLEL CIRCUIT...A circuit in which the circuit components are arranged in branches so that there is a separate path to each unit along which electrical current can flow.

PERMANENT MAGNET...A magnet which retains its property of magnetism for an indefinite period.

PLATE...A solid substance from which electrons flow. Batteries have positive plates and negative plates.

POLARITY...A collective term applied to the positive (+) and negative (-) ends of a magnet or electrical mechanism such as a coil or battery.

POLE...One or two points of a magnet at which its magnetic attraction is concentrated.

POLE SHOES...Permanent magnets fastened to the inside of a generator or motor housing.

POSITIVE...Designating or pertaining to a kind of electricity. Specifically, an atom which loses negative electrons and is positively charged.

PRINCIPLE OF TURNING FORCE...Explains how magnetic force acts on a current-carrying conductor to create movement of an armature such as in an electric motor.

PROTON...A particle which, together with the neutron constitutes the nucleus of an atom. It exhibits a positive charge of electricity.

RECTIFIER...A device (such as a vacuum tube, commutator, or diode) that converts alternating current into direct current.

REGULATOR...A device which controls the flow of current or voltage in a circuit to a certain desired level.

RELAY...An electrical switch which opens and closes a circuit automatically.

RELUCTANCE...The resistance that a magnetic circuit offers to lines of force in a magnetic field.

RESISTANCE...The opposing or retarding force offered by a circuit or component of a circuit to the passage of electrical current through it. Resistance is measured in ohms.

RESISTOR...A device usually made of wire or carbon which presents a resistance to current flow.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

ROTOR...The rotating part of an electrical machine such as a generator, motor, or alternator.

RIGHT-HAND RULE...A method used to determine the direction a magnetic field rotates about a conductor, or to find the north pole of a magnetic field in a coil.

SELF-INDUCTION...Voltage which occurs in a coil when there is a change of current.

SEMICONDUCTOR...An element which has four electrons in the outer ring of its atoms. Silicon and germanium are examples. These elements are neither good conductors nor good insulators. Semiconductors are used to make diodes and transistors.

SENDING UNIT...A device usually located in some part of an engine, to transmit information to a gauge on an instrument panel.

SEPARATOR...Any of several substances used to keep one substance from another. In batteries a separator separates the positive plates from the negative plates.

SERIES CIRCUIT...A circuit in which the parts are connected end to end, positive pole to negative pole, so that only one path is provided for current flow.

SERIES-PARALLEL CIRCUIT...A circuit in which some of the circuit components are connected in series and others are connected in parallel.

SHORT (OR SHORT CIRCUIT)...This occurs when one part of a circuit comes in contact with another part of the same circuit, diverting the flow of current from its desired path.

SHUNT...A conductor joining two points in a circuit so as to form a parallel circuit through which a portion of the current may pass.

SLIP RING...In a generator, motor, or alternator, one of two or more continuous conducting rings from which brushes take, or deliver to, current.

SOLENOID...A tubular coil used for producing a magnetic field. A solenoid usually performs some type of mechanical work.

SPARK PLUGS...Devices which ignite the fuel by a spark in a spark-ignition engine.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

SPECIFIC GRAVITY...The ratio of weight of any volume of a substance to the weight of an equal volume of some substance taken as a standard, usually water for solids and liquids. When a battery electrolyte is tested, the result is the specific gravity of the electrolyte.

SPRAG CLUTCH DRIVE...A type of flywheel engaging device for a starting motor.

STATOR...The stationary part of an alternator in which another part (the rotor) revolves.

STORAGE BATTERY...A group of electrochemical cells connected together to generate electrical energy. It stores the energy in a chemical form.

SULFATION...The formation of hard crystals of lead sulfate on battery plates.

SYNCHROGRAPH...An all-purpose distributor tester.

TACHOMETER...An instrument for measuring rotary speed, usually revolutions per minute.

TEMPORARY MAGNET...A magnet which loses its property of magnetism quickly unless forces act to re-magnetize it.

THERMISTOR...A temperature-compensated resistor. The degree of its resistance varies with the temperature in some regulators, it controls a Zener diode so that a higher system voltage is produced in cold weather, when needed.

TRANSISTOR...An electrical switch device constructed of semi-conducting materials that is used in circuits to control the flow of current. It operates by either allowing current to flow or not allowing it to flow.

TWENTY-HOUR RATING...The accessory capacity of a battery.

VISCOSITY...The internal resistance of a fluid, caused by molecular attraction, which makes it resist a tendency to flow.

VOLT...A unit of electrical pressure (or electromotive force) which causes current to flow in a circuit. One volt is the amount of pressure required to cause one ampere of current to flow against one ohm of resistance.

VOLTAGE...That force which is generated to cause current to flow in an electrical circuit. It is also referred to as electromotive force or electrical potential. Voltage is measured in volts.

FARM D. C. ELECTRICITY

GLOSSARY OF TERMS

VOLTMETER...An instrument for measuring the force in volts of an electrical current. This is the difference of potential (voltage) between different points in an electrical circuit. Voltmeters are connected across (parallel to) the points where voltage is to be measured.

WATT...A unit of measure for indicating the electrical power applied in a circuit. It is obtained by multiplying the current (in amperes) by the electrical pressure (in volts) which cause it to flow. That is: watts= Amperes x volts.

WATT-HOUR...A unit of electrical energy. It indicates the amount of work done in an hour by a circuit at a steady rate of one watt. That is, watt-hours = ampere - hours x volts.

WIRING HARNESS...The trunk and branches which feed an electrical circuit. Wires from one part of the circuit enter the trunk, joining other wires, and then emerge at another point in the circuit.

ZENER DIODE...A special diode that will conduct current in the reverse direction when the voltage becomes higher than a predetermined voltage.